

# Waste Treatment Lagoon

Alabama Guide Sheet No. AL 359



## Definition

A waste treatment lagoon is an earthen waste impoundment that biologically treats organic wastes, such as manure and wastewater.

## General Information

Lagoons must be located where the geology will not cause potential problems. Sites with sandy soils, high water tables, or areas in karst (limestone) topography will require extensive site evaluations.

Since lagoons are a potential odor source, they should be properly located considering prevailing winds, topography, vegetation, and neighbors in order to minimize odors.

Lagoons are designed to biologically treat the manures, wastewater, sludge, rainfall, and other wastes accumulated and to store the treated wastes until such time the waste can be properly utilized as fertilizer. Design storage periods are typically 120, 180, or 360 days. Lagoons are also designed to maintain a certain volume (treatment volume) even after periods of pump-out.

Solid waste accumulation in a lagoon can have detrimental effects on the waste treatment ability of the lagoon and can also create management problems. Whenever possible, solids should be separated from the manure and kept from entering the lagoon. The separated solids can be composted and land applied as fertilizer.

There are several different types of waste treatment lagoons.

### Standard anaerobic

Most lagoons are standard anaerobic type lagoons. These lagoons treat the waste utilizing anaerobic (without oxygen) bacteria. These type lagoons have the smallest surface area and are generally the most economical to construct; however, standard anaerobic lagoons have the most potential for odor.

### Facultative

Facultative lagoons are designed to be much larger than standard anaerobic lagoons. These lagoons have more dilute waste product and are generally odor free.

### Naturally aerobic

Naturally aerobic (with oxygen) lagoons are designed to be shallow with a large surface area. The large surface area allows for natural aeration to occur which allows aerobic bacteria to thrive. Aerobic lagoons are generally odor free.

### Mechanically aerated

Mechanically aerated lagoons are comparable in size to standard anaerobic lagoons and utilize mechanical (electric) aerators to provide the oxygen for the aerobic bacteria to thrive. Mechanical aerators are generally considered disadvantageous due to the expense of continuous operation.

Lagoons can also be designed as a two-stage system, utilizing two waste impoundments in series. This arrangement improves the wastewater treatment and gives more management flexibility. The second stage lagoon has much cleaner wastewater to utilize as flush water or recycle wastewater than from a single stage lagoon.

Liners in the lagoon are designed to reduce seepage to an acceptable level or less. Liners can be compacted with on-site clayey material, if available, or additives can be mixed with the soil to achieve the designed results. In extreme cases, synthetic or concrete liners may be required to restrict seepage. Provisions must be made to protect the constructed liner to ensure its integrity is not compromised.

Permanent markers are to be placed in the lagoon to mark the maximum liquid elevation and the lowest pump-down elevation.

Lagoons are designed with enough storage and freeboard to prevent the wastes from overtopping the embankment during rainfall events of 25-year, 24-hour or less, as long as the lagoon is properly operated and maintained.

Lagoons that are too heavily loaded with wastes can become odorous. These lagoons may need to be covered with biological or synthetic covers to help reduce or eliminate odors. Synthetic covers can also be used to trap gases that can be utilized as a potential energy source.

## Operation and Maintenance

Lagoon construction must be certified by qualified personnel that the facility was constructed according to the designed plans and specifications.

New lagoon embankments are to be properly vegetated. The interior slopes are to be either vegetated, mulched, or mechanically protected to prevent erosion of the liner.

Lagoons should be fenced and warning signs posted to ensure safety.

New lagoons must have a proper start-up procedure. An amount of fresh water equal to at least 60 percent of the treatment volume must be added prior to any waste being introduced into the system. Some lagoons may need "seeding" with wastewater from a working lagoon to introduce bacteria into the system.

If the use of an additive for odor control, emission control, sludge reduction, or biological activity

enhancement is planned for the lagoon, the additive should be reviewed and accepted for use by the Alabama Department of Environmental Management (ADEM) prior to use. If not on an approval list, a Material Safety Data Sheet (MSDS) and an aquatic toxicity testing report for the additive should be submitted to ADEM for approval.

Sludge in the lagoon may build up over time and encroach on the treatment volume. This can result in the lagoon becoming more odorous. If the sludge does build up, it should be removed and properly utilized as fertilizer.

All wastes removed from the lagoon shall be utilized as fertilizer at locations, times, rates, and volumes in accordance with a nutrient management plan that meets or exceeds NRCS technical standards and guidelines. Records shall be kept of the amount of wastes applied, location and acres where applied, and the date waste was applied.

The lagoon shall be operated so as to be at the minimum operating level at the beginning of each design storage period, particularly late fall. This allows for the planned storage during the winter months when waste cannot be land-applied.

The vegetation on the embankment should be routinely mowed. Trees and shrubs should not be allowed to grow within a potential distance of their root zones to the embankment.

Lagoons must have routine inspection to ensure that all components are operating as designed.

## References

- NRCS AL Conservation Practice Standard
  - Code 359 - Waste Treatment Lagoon
  - Code 634 - Manure Transfer
  - Code 590 - Nutrient Management
- AL NRCS Guide Sheets
  - AL 590 - Application Distances for Applying Animal Manure and Organic By-Products
  - AL 312 - Odor Control for Animal Feeding Operations
  - AL 634 - Wastewater Irrigation
- ASAE EP403.3 DEC 98, Design of Anaerobic Lagoons for Animal Waste Management

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